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ATTITUDE MANEUVER DESIGN FOR PLANAR SPACE SOLAR POWER SATELLITES

Michael A. Marshall,[*] Ashish Goel[†] and Sergio Pellegrino[‡]

This paper investigates the attitude dynamics of a planar space solar power satellite (SSPS) by formulating the power-optimal guidance problem as a nonlinear trajectory optimization problem. The power-optimal guidance problem determines the orientation of an SSPS throughout its orbit that maximizes the amount of power transmitted to Earth. This transmitted power is a function of the relative geometry between the SSPS, the Sun, and the receiving station. Hence, it is inherently coupled to the attitude of the SSPS, i.e., the orientation that maximizes power transmission changes as the relative geometry changes. We first approximate the discretized trajectory optimization problem as a quadratic program (QP). We then solve the QP to obtain attitude trajectory designs for various orbits. These solutions highlight how maximizing transmitted power typically requires large slew maneuvers. Ultimately, by quantifying control and propellant requirements for various orbits, we emphasize how maneuver dynamics play an important role in SSPS design. [View Full Paper]

[*] Graduate Research Assistant, Graduate Aerospace Laboratories, 1200 E. California Blvd., Mail Code 105-50, Pasadena, California 91125. E-mail: mmarshall@caltech.edu.
[†] Postdoctoral Researcher, Jet Propulsion Laboratory, 4800 Oak Grove Dr., Pasadena, California 91109. E-mail: ashish.goel@jpl.nasa.gov.
[‡] Joyce and Kent Kresa Professor of Aerospace and Civil Engineering; Jet Propulsion Laboratory Senior Research Scientist; Co-Director, Space-Based Solar Power Project, Graduate Aerospace Laboratories, 1200 E. California Blvd., Mail Code 105-50, Pasadena, California 91125. E-mail: sergiop@caltech.edu.